

This listing of claims will replace all prior versions, and listings, of claims in the application:

**Listing of Claims:**

Claim 1 (Currently Cancelled).  
Claim 2 (Currently Cancelled).  
Claim 3 (Currently Cancelled).  
Claim 4 (Currently Cancelled).  
Claim 5 (Currently Cancelled).  
Claim 6 (Currently Cancelled).  
Claim 7 (Currently Cancelled).  
Claim 8 (Currently Cancelled).  
Claim 9 (Currently Cancelled).  
Claim 10 (Currently Cancelled).  
Claim 11 (Currently Cancelled).  
Claim12 (Currently Cancelled).  
Claim 13 (Currently Cancelled).  
Claim 14 (Currently Cancelled).  
Claim 15 (Currently Cancelled).  
Claim 16 (Currently Cancelled).  
Claim 17 (Currently Cancelled).  
Claim 18 (Currently Cancelled).  
Claim 19 (Currently Cancelled).  
Claim 20 (Currently Cancelled).

Claim 21 (New Claim). A composition comprising:

a cerium doped lutetium yttrium orthosilicate mono crystal.

Claim 22 (New Claim). The composition of claim 21, wherein the crystal includes:

a monocrystalline structure of cerium doped lutetium yttrium orthosilicate,

$\text{Ce}_{2x}(\text{Lu}_{1-y}\text{Y}_y)_{2(1-x)}\text{SiO}_5$  where  $x =$  approximately 0.00001 to approximately 0.05 and  $y =$  approximately 0.0001 to approximately 0.9999.

Claim 23 (New Claim). The composition of claim 22 wherein  $x$  ranges from approximately 0.0001 to approximately 0.001 and  $y$  ranges from approximately 0.3 to approximately 0.8.

Claim 24 (New Claim). A method of making a crystal comprising the steps of:

- (a) mixing  $\text{Lu}_2\text{O}_3$ ,  $\text{Y}_2\text{O}_3$ ,  $\text{SiO}_3$ ,  $\text{SiO}_2$  together to form a mixture;
- (b) heating the mixture;
- (c) interacting the heated mixture with an LSO seed crystal; and
- (d) growing an LYSO crystal from the interaction.

Claim 25 (New Claim). The method of claim 24 wherein  $\text{Lu}_2\text{O}_3$  is substantially pure.

Claim 26 (New Claim). The method of claim 24 wherein  $Y_2O_3$  is substantially pure.

Claim 27 (New Claim). The method of claim 24, wherein  $SiO_2$  is substantially pure.

Claim 28 (New Claim). The method of claim 24, wherein the heating step includes:  
heating the mixture to a molten state.

Claim 29 (New Claim). The method of claim 24, wherein the growing step includes:  
separating and cooling the seed crystal.

Claim 30 (New Claim). A crystal scintillator comprising a transparent single crystal of cerium-activated lutetium yttrium oxyorthosilicate having the general formula  $Lu_{(2-x-z)}Y_xCe_zSiO_5$ , wherein  $0.05 \leq x \leq 1.95$  and  $0.001 \leq z \leq 0.02$ .

Claim 31 (New Claim). The crystal scintillator of claim 30, wherein  $0.2 \leq x \leq 1.8$ .

Claim 32 (New Claim). The crystal scintillator of claim 31, wherein said scintillator has a luminescence wavelength of about 420 nm.

Claim 33 (New Claim). The crystal scintillator of claim 32, wherein said scintillator has a luminescence decay time of about 35-45 ns.

Claim 34 (New Claim). A scintillation detector, comprising:

(a) a crystal scintillator comprising a transparent single crystal of cerium-activated lutetium yttrium oxyorthosilicate having the general formula  $\text{Lu}_{(2-x-z)}\text{Y}_x\text{Ce}_z\text{SiO}_5$  wherein  $0.05 \leq x \leq 1.95$  and  $0.001 \leq z \leq 0.02$ ; and

(b) a photodetector optically coupled to said crystal scintillator for detecting light from said crystal scintillator.

Claim 35 (New Claim). The detector of claim 34, wherein said photodetector comprises a photomultiplier tube.

Claim 36 (New Claim). The detector of claim 34, wherein said photodetector comprises a charge-coupled device.

Claim 37 (New Claim). A scintillation detector, comprising:

(a) a crystal scintillator comprising a transparent single crystal of cerium-activated lutetium yttrium oxyorthosilicate having the general formula  $\text{Lu}_{(2-x-z)}\text{Y}_x\text{Ce}_z\text{SiO}_5$  wherein  $0.2 \leq x \leq 1.8$  and  $0.001 \leq z \leq 0.02$ ; and

(b) a photodetector optically coupled to said crystal scintillator for detecting light from said crystal scintillator.

Claim 38 (New Claim). The detector of claim 37, wherein said photodetector comprises a photomultiplier tube.

Claim 39 (New Claim). The detector of claim 37, wherein said photodetector comprises a charge-coupled device.